Package 'whitestrap'

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Type Package

Title White Test and Bootstrapped White Test for Heteroskedasticity

Version 0.0.1

Description Formal implementation of White test of heteroskedasticity and a bootstrapped version of it, developed under the methodology of Jeong, J., Lee, K. (1999) <https://yonsei.pure.elsevier.com/en/publications/bootstrapped-whites-test-for-heteroskedasticity-in-regression-mod>.

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BugReports https://github.com/jlopezper/whitestrap/issues

Encoding UTF-8

LazyData true

RoxygenNote 7.0.0

Imports stats, graphics

Depends R (>= 2.10)

Suggests testthat, covr

NeedsCompilation no

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Repository CRAN

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Contents

`white_test` *This function performs a White's Test for heteroskedasticity (White, H. (1980))*

Description

White's test is a statistical test that determines whether the variance of the residuals in a regression model is constant.

Usage

```
white_test(model)
```

Arguments

`model`	An object of class `lm`

Details

The approach followed is the one detailed at Wooldridge, 2012, p. 275. The fitted values from the original model are:

$$\widehat{y_i} = \widehat{\beta_0} + \widehat{\beta_1} x_{i1} + ... + \widehat{\beta_k} x_{ik}$$

Heteroscedasticity could be tested as a linear regression of the squared residuals against the fitted values:

$$\widehat{u^2} = \delta_0 + \delta_1 \widehat{y} + \delta_2 \widehat{y^2} + error$$

The null hypothesis states that $\delta_1 = \delta_2 = 0$ (homoskedasticity). The test statistic is defined as:

$$LM = nR^2$$

where R^2 is the R-squared value from the regression of u^2.

Value

AA list with class `white_test` containing:

`w_stat`	The value of the test statistic
`p_value`	The p-value of the test

References

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. Econometrica, 48(4), 817-838.

Wooldridge, Jeffrey M., 1960-. (2012). Introductory econometrics : a modern approach. Mason, Ohio : South-Western Cengage Learning,

See Also

lm

Examples

```
# Define a dataframe with heteroscedasticity
n <- 100
y <- 1:n
sd <- runif(n, min = 0, max = 4)
error <- rnorm(n, 0, sd*y)
X <- y + error
df <- data.frame(y, X)
# OLS model
fit <- lm(y ~ X, data = df)
# White's test
white_test(fit)
```

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white_test_boot *Bootstrapped version of the White's test (Jeong, J., Lee, K. (1999))*

Description

This is a versioned White's test based on a bootstrap procedure that can improve the performance of White's test, specially in small samples. It was proposed by Jeong, J., Lee, K. (1999) (see references for further details).

Usage

```
white_test_boot(model, bootstraps = 1000)
```

Arguments

model	An object of class lm
bootstraps	Number of bootstrap to be performed. If 'bootstraps' is less than 10, it will automatically be set to 10. At least 500 simulations are recommended. Default value is set to 1000.

Details

The bootstrapped error term is defined by:

$$\widehat{u_i} = \sigma^2 * t_i^*(i = 1, ...N)$$

where t_i^* follows a distribution satisfying $E(t) = 0$ and $var(t) = I$.

In particular, the selected distribution of t can be found at the bottom of page 196 at Handbook of Computational Econometrics (2009).

Value

A list with class `white_test` containing:

`w_stat`	The value of the test statistic
`p_value`	The p-value of the test
`iters`	The number of bootstrap samples

References

Jeong, J., & Lee, K. (1999). Bootstrapped White's test for heteroskedasticity in regression models. Economics Letters, 63(3), 261-267.

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. Econometrica, 48(4), 817-838.

Wooldridge, Jeffrey M., 1960-. (2012). Introductory econometrics : a modern approach. Mason, Ohio : South-Western Cengage Learning,

Examples

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# Define a dataframe with heteroscedasticity
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y <- 1:n
sd <- runif(n, min = 0, max = 4)
error <- rnorm(n, 0, sd*y)
X <- y + error
df <- data.frame(y, X)
# OLS model
fit <- lm(y ~ X, data = df)
# White's test
white_test_boot(fit)
```

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